RA
997
.N32
1988

A NATIONAL AND CROSS-NATIONAL STUDY OF LTC POPULATIONS

EXECUTIVE SUMMARY

I. Study Objectives

The demand for all types of long term care (LTC) services is expected to increase rapidly because of the projected rapid growth of the U.S. elderly population. By 1995, for example, the number of elderly (65+) persons in the U.S. is expected to increase 23 percent from 28.4 million persons (in 1984) to 34.7 million. The population aged 85 years and over (the "oldest-old") is expected to experience even more rapid growth--from 2.9 million in 1984 to 4.5 million persons in 1995. The growth of the oldest-old population is of particular to concern to policy makers since it is projected to consume the largest amount of federal benefits by the year 2000 (Torrey, 1984).

Currently, the bulk of publicly financed LTC service used by the elderly is provided by the Medicaid and Medicare programs in the form of reimbursement for nursing home and home health services. Other programs providing social, housing or nutritional services for the elderly are funded through Title III of the Older Americans Act, Title XX of the Social Security Act (Social Service Block Grants), the Veterans Administration, and a patchwork of state-sponsored programs. Coordination of these services has been studied under the National Channeling and other LTC demonstration projects.

Unfortunately, factors increasing the demand for LTC services, such as the unprecedented growth of the elderly population, and factors constraining the availability of both formal and informal services such as reductions in family size, as well as constraints on the future construction of nursing home beds, may adversely affect the potential to provide adequate levels of LTC services to meet the expected increased demand. This imbalance between future demand and supply of LTC services will require formulation of alternative service strategies and reimbursement policies to successfully meet the anticipated future demand for services.

To plan these alternative strategies for providing adequate future levels of LTC services one needs a comprehensive model to predict the nature and amount of LTC service needs required at different future points in time. To implement such a comprehensive model one needs both to develop adequate methodology for such a model and to analyze a wide range of data in order to determine the actual conditions and mechanisms affecting changes in demand for services and the ability of different sources of LTC services to meet different types of demand.

Thus, the primary objectives of this project were two-fold: first, to assess the size, characteristics and future growth of the elderly LTC population in the United States and a number of other countries; second, development of forecasting and simulation models that utilized this input in order to develop policy planning and evaluation tools. In addition we also analyzed a number of basic policy issues such as utilization of Medicare home health services and its reimbursement, the impact of PPS on temporal trends in hospital readmissions and mortality, recalibration of underwriting factors of the AAPCC, and studies of Medicaid spend-down on the use of nursing homes. We are also currently providing technical consultation on the 1982-1984 National Long Term Care Surveys public use tape and documentation. These objectives were addressed using the following research plan:

A. Multivariate Analysis of the 1982 National Long Term Care Survey (NLTCS)

The level and type of functional impairments, medical conditions and the LTC services and

social context that support the disabled elderly in the community were assessed using multivariate procedures. These analyses were carried out using Grade of Membership (GOM) modeling techniques applied to both cross-sectional health and longitudinal service use data from the 1982 NLTCS. From that survey 56 Activities of Daily Living (ADL)[1], Instrumental Activities of Daily Living (IADL)[1], IADL2[1] and medical condition variables were analyzed (after analyses of much larger groups of variables) to identify subgroups characterized by differentials in health and functional status in the community resident LTC population. The association of formal and informal care service use with the subgroups was examined.

B. Cross-Sectional and Longitudinal Analyses of the National Long Term Care Survey

Cross-sectional multivariate analyses of the 1982 and 1984 NLTCS was conducted to determine if the profiles of the health and functional attributes that identified the subgroups of the noninstitutionalized LTC population had changed over that time period or if subgroup frequencies in the population had changed. A longitudinal GOM analysis of data on persons observed in both the 1982 and 1984 surveys was performed to assess changes in the profiles of disability, medical, and other attributes for individuals and the association of the multivariate profiles identified in 1982 with the risk of institutionalization or death in the period between the two surveys. In addition, life table analyses of different types of Medicare Part A service use were conducted for each of the subgroups found in the GOM analyses.

C. Projections and Forecasts

Projections and forecasting of the LTC population by sex, age, marital status, disability level and type over the period 1980 to 2040 were made to quantify the growth of need for LTC services. In addition to providing baseline projections utilizing the middle variant of the population projections produced by the Social Security Actuaries a number of simulation exercises and sensitivity analyses, involving alternative assumptions about the rate of growth of the national supply of institutional beds and about changes in future morbidity, mortality and disability rates were conducted. Outcome measures projected included the number of disabled persons, the number of informal caregivers needed to maintain current levels of informal care, the number of hours of informal care delivered and the need for different types of medical and LTC manpower.

D. Analysis of the International Variation of LTC Service Needs

Cross-sectional analysis of disability patterns in the community-based elderly populations was done in a number of developed and developing countries in order to (a) describe international patterns in the need for and delivery of LTC services, and (b) contrast the current pattern of LTC services used in the U.S. with service use patterns in other countries. The analyses employed the cross-sectional GOM statistical methods used in the studies of the 1982-1984 NLTCS applied to a number of national surveys of health and functioning among the elderly.

[1]ADL, IADL, and IADL2 describe different functions that a "normal" individual is expected to be able to carry out. ADLs, for example, involve such self-care activities as eating, bathing, dressing, toileting and mobility (e.g., getting in/our of bed; getting around inside). There are different ways that limitations in these functions can be ascertained depending upon the questions used. We have tended to use six very basic ADLs described by Katz and Akpom(1976) that tend to form a hierarchy of intensity of functional loss. IADLs represent a series of probability higher order functions requiring skills necessary for daily living, e.g., doing laundry, cooking, grocery shopping. They also involve activities that measure cognitive level, e.g., telephoning, taking medication, managing money. Being more complex functions they may represent limitations beyond those of the physical capacity to carry out activities, e.g., cooking may depend upon skills more commonly learned by women. The IADL2s represent the capacity to carry out basic physical actions, e.g., climbing stairs, holding, reaching, grasping. Thus, each of the three sets of functional measures relates to somewhat different dimensions of functional capacity.

E. Health Need and Service Utilization Profiles

We produced profiles of health needs and service utilization among the elderly populations of a number of countries and analyzed them using life table models of the interrelation of mortality, disability, and mortality. These procedures were used to control for differences in the exposure of each of the functional and health status subgroups to different types of service use.

II. Data

A wide range of data was employed in these analyses.

A. The 1982 and 1984 National Long Term Care Surveys

The 1982 and 1984 National Long Term Care Surveys were designed to provide a longitudinal, nationally representative database describing the chronically disabled, elderly population residing in the community. The surveys covered five major areas of interest in that population, namely, (1) medical status, (2) functional status, (3) income and assets, (4) use of heath care services and sources of payment, and (5) housing and living arrangements.

1. The 1982 National Long Term Survey

A core sample of 35,789 persons was drawn from the Medicare Health Insurance Skeleton Eligibility Write Off file. These records were selected by drawing "reduction sets" from a master sample of 55,000 records. The reduction sets were drawn and screened until 6,393 candidates for the detailed community survey were identified who required (or were expected to require) assistance with ADLs or IADLs for a period of three months or longer. Survey work began in June, 1982 and continued to October and produced 6,088 household interviews from the original group of 6,393. The detailed survey administered was divided into seven sections: (1) functional status (covering medical conditions, disabilities,and caregivers), (2) other functioning (covering mental and emotional status, social contacts and activities), (3) housing and neighborhood characteristics, (4) health insurance (covering type of public or private assistance/insurance plan and coverage provided), (5) medical providers and prescription medicine, (6) cognitive functioning, and (7) military service, ethnicity, income and assets. Although no interviews of institutionalized persons were conducted, a set of 1,992 such persons was identified from the screening interview.

A survey of informal caregivers was also administered to those providing care to the sample person (N=1,626), and a similarly structured survey was given to 299 persons who had stopped giving care.

2. The 1984 National Long Term Care Survey

Follow-up of the 1982 survey population was conducted in 1984 to determine factors contributing to or inhibiting change in functional and health status and institutionalization. This follow-up had both longitudinal and cross-sectional components, and included persons alive in 1984 who (1) had functional limitations and were eligible for the 1982 questionnaire (N=5,010); (2) were institutionalized and thus not eligible for the 1982 questionnaire (N= 1,182); (3) were screened, but not eligible for the 1982 questionnaire (N=11,130), or (4) attained age 65 since the 1982 survey (N=4,860).

Persons in the first two groups were automatically administered a detailed household

questionnaire, and persons in the latter two groups were screened for functional limitations with persons reporting chronic ADL or IADL impairments receiving a detailed questionnaire. The total number of detailed interviews administered of all types was approximately 10,000. Three types of survey instruments were used in addition to the screener and control card. The first was the detailed community questionnaire (administered to 5,934 subjects)--similar to the instrument administered to the 6,088 subjects interviewed in 1982. The second questionnaire inquired about persons who died between the survey dates. This instrument was unique to the 1984 survey and was administered to 2,475 subjects' next-of-kin. The instrument covered health care, payment, caregiver and sociodemographic information. The third was an institutional questionnaire (administered to 1,690 subjects)--covering institutionalized persons' cognitive functioning, ADL limitations, admission to and payment for nursing home services, and information on the institution itself (e.g., number of certified beds, Medicare and Medicaid certifications).

3.) Linkage of the 1982 and 1984 Surveys to Medicare Files

In addition to the survey records, all individuals in the 1982 cross-sectional sample were linked to Medicare Part A (and Part B records for Home Health services) records for the period 1978 to 1985. All persons in the 1982-1984 longitudinal file were linked to Medicare Part A records from 1980 to 1987 and to Medicare Part B records from 1984 to 1987. These record linkages provide a wide range of detailed service data on the federally reimbursed acute and post-acute medical care usage of the surveyed population.

B. International Datasets

1. Indonesian Disability Survey

During 1976-77, a survey focusing on disability, impairments, and handicaps was carried out by the Institute of Health Research and Development, Department of Health in Jakarta with technical support and financial backing from the World Health Organization. A sample of 4,604 households in 14 provinces from Sumatra, Java and Bali was selected, divided into a rural and urban domain. From the 4,604 households, information from 22,468 persons of all ages was obtained.

The list of impairments, disabilities and handicaps used in the study was derived from a early draft of the World Health Organization Classification of Impairments, Disabilities, and Handicaps which was published in 1980 three years after the survey's completion. Disabilities and handicaps were selected to represent conditions common in Indonesian daily life, as were questions on socioeconomic status, education, occupation, welfare, and medical facilities. Questionnaires were administered by approximately 70 local physicians who had completed a special 2-week training course.

2. The Republic of Korea, Philippines, Malaysia, Fiji

In 1984, the World Health Organization carried out surveys of the elderly population of four countries in the Western Pacific Region: The Republic of Korea, Philippines, Malaysia, and Fiji. The surveys were administered to 3,504 persons and are representative of the population in selected areas for persons aged 60 years and over, by sex, and urban/rural status. Specific information was collected on health status, ADL and IADL limitations, health service use, living arrangements, and informal and social support.

C. Other U.S. Data Sets

Though the 1982 and 1984 NLTCS provided most of the information for our analyses, use

was also made of several other U.S. data sets. In particular, since the non-disabled population was not interviewed in the NLTCS use was made of the 1984 Supplement on Aging (SOA) (and its 1986 longitudinal follow-up, LSOA) survey to develop measures of the prevalence of medical problems among non-chronically disabled persons. Use was also made of both the 1977 and 1985 National Nursing Home Survey (NNHS) to provide detailed estimates of the current utilization of nursing homes for our projection and simulation models. Finally, a variety of series of the official estimates and projections of the Social Security and Medicare beneficiary population produced by the Social Security actuaries to estimate the current and future liabilities of the Social Security trust fund were utilized. The Census Bureau projections differ somewhat in detail from the Social Security Actuary projections but utilize many of their basic assumptions about such factors as mortality. Also the Census Bureau base and the Social Security base differ in that the Social Security projections are developed specifically for the trust funds. Given our interest in the Medicare eligible population, the SSA projections seemed to be the most appropriate projections to use.

III. Methodology

A major aspect of this study was the development of statistical methodologies appropriate to the special types of data to be analyzed. In particular, there has been little development of event history models to deal with the new type of data (i.e., surveys with complex sample designs of a nationally representative longitudinally followed population where health and functional status changes were described in terms of a large number of discrete response variables with survey records linked to continuous medical service use files) produced by the 1982 and 1984 NLTCS and its Medicare file linkages. Thus, major efforts were required to develop new statistical procedures to deal with this highly multivariate, multiple episode event history data generated from complex sample surveys. These newly developed analytic procedures were employed in the analyses undertaken in the research project. In this section, we will briefly describe each methodology and provide an overview of its range of application. Detailed discussions of these methodological techniques (including mathematical derivations) can be found in the Final Report.

A. Transition Rates, Transition Probabilities, and Other Types of Probabilities

Transition rates were estimated for the two-year transitions between 1982 and 1984. Of most interest were functional status changes a.) for the community population from the nondisabled to disabled states (specific to functional level) and from different disability states to other disability states (or nondisabled), b.) from community residence (either disabled or not) to institutions, c.) from institutional status to community status (specific to functional state), and d.) from all of the above states to death. These transitions were calculated for the total population and for sex, age, and morbidity status subgroups.

A critical methodological issue in these calculations was the determination of the appropriate sample weights. On the public use file the Census Bureau provided "longitudinal" sample weights which allow one to examine the 1982 status of persons who were surveyed in 1984. Thus, these are, in effect, "retrospective" because certain 1982 "non-response" groups were given "zero" sample weights. In order to calculate prospective weights (i.e., to determine transition rates for the 1982 population to their 1984 status), a new set of weights had to be calculated based on all persons in the 1982 sample who were eligible to be part of the 1984 sample. These new weights were then used in the transition analyses. In addition a series of judgements had to be made on how to resolve slight difference in procedures between the 1982 and 1984 surveys. For example, not all persons interviewed in 1982 were screened (i.e., persons in institutions or who were disabled in 1982 automatically were interviewed). Thus, judgements had to be made on how to derive the most comparable 1984 disabled population. A second issue involved differences in the

way institutional status was determined in 1982 and 1984. In 1982, since no interviewing was done in institutions, only residence in a specific type of facility was ascertained. In 1984, in contrast, disability status was ascertained for persons in institutions. In addition, institutional status, as defined in the survey, is defined more broadly than in the NNHS. Hence, care had to be taken in developing as comparable a set of definitions as possible appropriate to the specific analysis being conducted (e.g., cross-temporal comparisons of the 1982 and 1984 NLTCS; comparisons of the 1984 NLTCS and the 1985 NNHS).

B. The Grade of Membership Model

The Grade of Membership model is a multivariate event history analytic strategy based on a "fuzzy set" classification procedure. This procedure can be utilized to identify subpopulations or "pure types" within a dataset that have similar physiological characteristics, similar demographic attributes, and similar responses to physical measurements as they relate to morbidity and disability. The mathematical development of this technique has been described previously (Woodbury et al., 1978; Woodbury and Manton, 1982), and has been successfully applied to several longitudinal data sets.

The Grade of Membership analysis is performed to describe subpopulations in terms of two types of parameters. The first represents the probabilities that persons in a given subpopulation have a particular attribute or quality. The second type of parameter represents how well individuals are described by each of the typical characteristics of the analytically defined subpopulations. Hence, they represent individual differences not captured by the multivariate descriptions of the subpopulations.

Two types of applications of the Grade of Membership analysis were developed: Cross-sectional and longitudinal. In the cross-sectional analyses the attributes measured at a given point in time were evaluated. In the longitudinal analysis two types of change were analyzed. The first were changes in the health and functional status of persons. Since the health and functional status of persons was summarized by a set of individual scores, the overall change in health is represented by the change in these scores calculated for the same person at two or more points in time. A second set of calculations involved assessing differences in the probability and duration of different types of service use (e.g., hospital, SNF, home health). This is done by calculating life tables for different types of service use (see next section) for persons with different health and functional status scores. Thus, the impact of a rich set of health and functional status measures on service use transitions could be determined.

C. Life Table Analysis

Life tables are a methodology for examining the duration dependence of various types of transitions. For example, the best known use of life tables is to describe how the risk of death changes with age. Life table methodologies can, however, be used to describe the duration dependence of other types of transitions. In the analyses conducted, life tables were calculated for both different types of health care service use and for adverse health service outcomes such as mortality or rehospitalization. By calculating life tables for changes between different types of service use, mortality and the "end of study" it is possible to make adjustments in the duration weighted measures of service use for various types of "censoring" through competing risk adjustments. Such competing risk adjustments help control bias in our estimates of the duration and intensity of service use both for competing health changes and for artifacts of the data observation plan such as limits to the length of the study or the effects of periodic reassessment. Such life table based measures were used to analyze data from the Medicare Part A service use records.

D. Projections and Forecasts, 1980-2040

Using data from the 1982 National Long Term Care Survey, we initially generated projections of the long term care population by age, sex, marital status, and disability level after the population had been adjusted for nursing home residence rates estimated from the 1977 NNHS. This produced age, sex, marital status and disability level specific projections of the noninstitutionalized elderly population for 1980, 1990, 2000, and 2040. Similar projections were performed for the institutionalized population under the assumption that the annual nursing home utilization rate increased about 2.1 percent per year. In addition to projecting the number of disabled persons we also projected the numbers of informal caregivers and the hours of care required by these disabled persons. The projections were subsequently updated with data from the 1984 NLTCS, the 1985 NNHS and with new (1987; Series 99) SSA population projections.

Both sets of projections described above assume that the current rate structure is stable through time. However, changes in health status at later ages will have significant effects on the growth of the long term care community and institutionalized populations. To represent this effect, we computed another set of projections under the assumption that disability rates will be reduced proportionally as fast as the mortality rate declines assumed in the Social Security population projections. We also produced projections where the medical condition causing the disability was identified so that projections of disability could be modified to reflect assumptions about interventions in the risks of specific chronic conditions.

In addition to the U.S. projections a number of projections were prepared for an international study sponsored by the HCFA administrator and coordinated by the HCFA Office of Legislation and Policy. In those analyses rates of disability from the 1982 National Long Term Care Survey and the 1977 National Nursing Home Survey were applied to age and sex specific population counts from U.N. estimates and projections. This was done for all 151 countries that are member states of the U.N. Those estimates were compared with the available data from specific countries to determine international differences in the epidemiology of disability and in institutionalization policies after population structure was controlled.

IV. Selected Major Findings

A. Projections of the Growth of the U.S. LTC Population

A fundamental issue in evaluating the service needs of the elderly population is to describe changes in the distribution of functional dependency and medical problems within that population. These parameters describe the context within which privately and publicly financed systems for providing acute, post-acute and long term health care must function. It also provides the standards against which the performance of those systems to meet LTC service needs must be assessed.

In order to define these basic parameters we conducted a series of projections of the size of the functionally disabled population using, initially, data from the 1982 NLTCS, the 1977 NNHS, and the 1982 SSA Office of the Actuary projections of the social security beneficiary population. We subsequently updated those projections with data from the 1984 NLTCS, the 1987 NNHS and the 1987 SSA projections.

From those data sources we estimated current disability and institutionalization rates from the NLTCS and NNHS on an age, sex, functional status, and marital status specific basis. The rates were applied to age, sex, and marital status specific population projections for 1985, 1990, 2000, 2040, and 2060. Functional status was grouped into five categories, i.e., those with no chronic disabilities, those with an impairment in one or more instrumental activities of daily living (IADL)

but no impairments in activities of daily living (ADL); and those with 1 to 2, 3 to 4, or 5 to 6 impairments in ADLs. Chronicity was based upon the NLTCS definition of an impairment lasting (or being expected to last) 90 days or more. These calculations produced estimates, by age, sex and marital status, of the numbers of functionally impaired persons at each of the projected dates. Selected numbers from the updated projections, specific to age, sex and level of functional impairment, are presented in Table 1 for 1985, 2000, 2020, and 2040.

The projections dramatically show the growth of the functionally impaired population in the community. For example, the community disabled population grows by 167% (from 5.5 to 14.8 million) from 1985 to 2040. Furthermore, this growth is most rapid (328%; from 1.1 to 4.7 million) for the oldest-old and most functionally disabled populations. The institutional population also grows more rapidly. Given the high level of need for both acute and LTC health services of these functionally impaired persons, this implies a huge increase in the future need for these services that likely can be met only by a coordinated public-private response.

The primary forces driving the dramatic increase in the population requiring LTC assistance are demographic. One demographic factor in this change is the future magnitude of reductions in mortality. As mortality is reduced at later ages, the period of time that persons will live at ages with high risk of serious functional impairment will increase. Projections in mortality are, however, uncertain.

A second demographic factor is the fact that birth cohorts have grown in size. Thus, given the same probability of surviving to age 65, there were 71% more persons passing age 65 in 1985 than in 1960. The initial size of cohorts are known to a high degree of precision from the decennial census. Thus, we see in Table 1 large increases in the population aged 65+ between 2000 and 2020 (41% increase), and of the population aged 85+ between 2020 and 2040 (82% increase), a result of the large post WWII baby boom cohorts passing ages 65 and 85 in those intervals. Thus, the growth of the need for LTC services will have a very uneven tempo due to differences in the size of the birth cohorts passing age 65 at different future dates.

Given the certainty of cohort size differentials and the uncertainty of future mortality changes, we present in Table 2 two alternative sets of projections for the total population specific to age and disability level. One set represents pessimistic mortality assumptions where the rate of decline in mortality is one half that in the "medium" variant SSA projections. The second is based on optimistic mortality assumptions where mortality reductions occurred at twice the rate as in the SSA medium mortality assumption variant.

What we see is that, even under the worst-case mortality assumptions, between 1985 and 2060 there will be significant growth (163%) in the disabled and institutionalized populations due to the much larger size of the birth cohorts passing ages 65 and 85 in 2010 and 2040. Under the most favorable mortality change assumptions the increase will be 237% (i.e., from 6.8 to 23.6 million persons). This suggests that, despite uncertainty in mortality assumptions, there will be extremely large increases in the need for LTC services in the future due simply to differences in birth cohort sizes.

More sensitive to the mortality assumptions is the number of oldest-old, highly disabled and institutionalized persons. However, even these groups will increase markedly. For example, if we examine only persons aged 85+ with 5 to 6 ADL impairments or who are aged 85+ and institutionalized we see that, under the worst-case mortality assumptions, there will be an increase of 281% (i.e., from 829 thousand to 3.2 million). Since these persons will be the most frail and require the greatest amounts of LTC services this increase alone signifies a large increase in the demand for LTC services. If we consider the "best case" mortality assumptions for this same group we find an increase of 503% (i.e., from 829 thousand to 5.7 million). What this variability

TABLE 1: Projections of the U.S. Long-Term Care Population in the Community and in Institutions, by Age, Sex, and Level of Impairment for 1985, 2000, 2020 and 2040 (in thousands)

YEAR	COMMUNITY								INSTITUTIONALIZED		TOTAL	
	Level Of Impairment											
	IADL Only		1-2 ADL		3-4 ADL		5-6 ADL					
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
1985												
Age 65-74	337	511	228	423	127	191	131	150	80	133	902	1,409
Age 75-84	274	562	218	550	99	237	126	194	141	364	858	1,903
Age 85+	87	194	106	302	48	133	63	172	112	481	416	1,283
TOTAL	698	1,267	551	1,275	274	562	320	517	332	978	2,176	4,599
2000												
Age 65-74	376	534	254	445	142	201	146	163	89	135	1,007	1,478
Age 75-84	394	753	315	719	141	312	181	262	206	463	1,237	2,509
Age 85+	142	323	166	502	78	222	106	286	167	802	659	2,135
TOTAL	912	1,610	735	1,666	361	735	433	711	463	1,401	2,904	6,122
2020												
Age 65-74	668	869	447	726	254	329	255	267	174	219	1,799	2,409
Age 75-84	500	892	397	844	181	366	232	312	253	538	1,563	2,952
Age 85+	213	450	248	699	116	309	159	399	249	1,114	985	2,971
TOTAL	1,381	2,211	1,092	2,269	551	1,004	647	977	676	1,871	4,346	8,332
2040												
Age 65-74	666	845	442	710	254	322	252	266	187	209	1,800	2,353
Age 75-84	894	1,484	725	1,395	316	606	402	520	502	822	2,839	4,887
Age 85+	427	789	496	1,222	233	542	321	701	497	1,925	1,975	5,179
TOTAL	1,987	3,120	1,663	3,327	804	1,471	975	1,487	1,187	3,016	6,616	12,419

Totals may reflect rounding error.

Source: Tabulations of 1982 and 1984 National Long Term Care Survey, and 1985 National Nursing Home Survey

TABLE 2

Projections of the Community-Based Disabled, Institutionalized, and Non-Disabled Elderly Population, 1985-2060, by Disability Level Measured by Activities of Daily Living (ADL) and Instrumental Activities of Daily living (IADL) (numbers in thousands)

	UPPER BOUND POPULATION PROJECTION (Rapid Mortality Rate Decline Assumptions)[1]						
	Non-Disabled[3]	Community-Based Disabled[4]					Institutionalized[5]
Year		IADL Limitation	1-2 ADL Limitations	3-4 ADL Limitations	5-6 ADL Limitations	Total	
				Aged 65-74			
1985	14,692	848	651	319	281	2,098	212
2000	16,114	910	701	344	312	2,267	219
2020	27,789	1,539	1,187	587	545	3,857	362
2060	27,744	1,497	1,163	580	561	3,800	339
				Aged 75-84			
1985	6,061	836	768	336	321	2,261	505
2000	8,618	1,173	1,052	463	455	3,143	675
2020	11,103	1,482	1,296	579	587	3,945	796
2060	18,005	2,367	2,007	901	949	6,223	1,196
				Aged 85+			
1985	1,008	282	407	181	236	1,106	593
2000	1,803	500	716	321	422	1,958	1,035
2020	2,788	803	1,136	513	677	3,128	1,611
2060	8,280	2,085	2,896	1,319	1,748	8,049	3,954
				Aged 65+			
1985	21,761	1,965	1,826	836	837	5,465	1,310
2000	26,535	2,583	2,468	1,128	1,189	7,368	1,929
2020	41,881	2,824	3,619	1,679	1,808	1,093	2,770
2060	52,239	5,949	6,066	2,800	3,258	18,072	5,489

TABLE 2 (continued)

LOWER BOUND POPULATION PROJECTION (Slow Mortality Rate Decline Assumption)[2]

Year	Non-Disabled[3]	Community-Based Disabled[4]					Institutionalized[5]
		IADL Limitation	1-2 ADL Limitations	3-4 ADL Limitations	5-6 ADL Limitations	Total	
				Aged 65-74			
1985	14,692	848	651	319	281	2,098	212
2000	15,834	909	697	343	304	2,253	229
2020	26,359	1,538	1,164	581	504	3,786	421
2060	28,581	1,712	1,278	646	541	4,176	514
				Aged 75-84			
1985	6,061	836	768	336	321	2,261	505
2000	8,148	1,117	1,012	442	430	3,002	662
2020	9,629	1,317	1,181	520	508	3,537	781
2060	14,506	2,002	1,830	782	762	5,376	1,256
				Aged 85+			
1985	1,088	282	407	181	236	1,106	593
2000	1,530	430	619	277	363	1,688	901
2020	1,952	551	792	354	463	2,160	1,153
2060	3,887	1,085	1,559	695	907	4,247	2,254
				Aged 65+			
1985	21,761	1,965	1,826	836	837	5,465	1,310
2000	25,512	2,457	2,328	1,062	1,097	6,943	1,792
2020	39,940	3,406	2,147	1,455	1,475	9,483	2,356
2060	46,974	4,799	4,667	2,123	2,210	13,799	4,023

[1]Assumes that mortality rates will decline at double the rate of current best estimates of rate of mortality decrease.

[2]Assumes that mortality rates will decline at half the rate of current best estimates of rate of mortality decrease.

[3]Source: Social Security Administration, Office of the Actuary: Social Security Area Population Projections: 1987, Actuarial Study No. 99. SSA Pub. No. 11-11546, 1987.

[4]Source: 1984 National Long Term Care Survey

[5]Source: 1985 National Nursing Home Survey

Totals may reflect rounding error.

in outcome shows is that we must carefully monitor the growth of this population to make long range plans for service for it is not simply enough to know that the increase will be great. There will be a dramatic difference in the levels of LTC service required (i.e., 281% versus 503% -- an absolute difference of 2.5 million cases) depending upon which set of assumptions proves most accurate.

A second major source of uncertainty in the projection of the growth of the population in need of LTC are possible changes in this group's functional and health status. Specifically, because of improvements in health services in the U.S., improvements in the standard of living and improvements in nutrition and lifestyle (e.g., reduced fat intake, reduced tobacco consumption), it is likely that cohorts aged 65+ and 85+ in the future will be in better health than current elderly cohorts. In order to illustrate this effect, in Table 3, we provide projections where the medical problem most frequently reported as causing disability in the 1984 NLTCS, arthritis, is assumed to be reduced 50%.

TABLE 3: Projections of the U.S. Long Term Care Population, by Age and Disability Level, Assuming 50% Reduction in the Presence of Arthritis; and Baseline Projections, 2000 and 2040

Age	Assuming 50% Reduction in Prevalence of Arthritis		Baseline	
	2000	2040	2000	2040
65-74	2,011	3,344	2,261	3,757
75-84	2,753	5,679	3,076	6,342
85+	1,647	4,277	1,826	4,733
TOTAL	6,411	13,300	7,163	14,832

Totals may reflect rounding error.
Source: Tabulations of 1982 and 1984 National Long Term Care Survey

We see that if a public health intervention could be introduced that would reduce the prevalence of arthritis by 50% it would have a considerable potential impact on the need for LTC services (about 11% or 752,000 fewer elderly disabled in 2000; 10% or 456,000 fewer persons aged 85+ in 2040). The problem is that the diseases for which we know the most about risk factors and control (e.g., heart diseases, stroke, cancer) are lethal diseases that produce relatively little long-term disability. In contrast, the chronic degenerative diseases producing the most long-term disability (e.g., dementia, osteoporosis, rheumatoid and osteoarthritis) are now not as well studied and for which we have fewer effective controls. Thus, without considerable new research on these other disabling diseases, total life expectancy is likely to increase more rapidly than disability-free life expectancy. This will tend to increase the prevalence of disability and the need for LTC services.

A third source of uncertainty in these projections is the nature of the LTC services utilized. For example, there is considerable interest in determining if informal and formal care services

delivered in the home can defer or eliminate the need for certain types of institutionalization. The effects of different rates of institutionalization on the growth of the community resident disabled population is represented in Table 4.

TABLE 4: Projections of the Community Resident U.S. Long Term Care Population Assuming Specified Limitations of Growth of Beds in Institutions, by Age, for 1985, 2000, 2020 and 2040 (in thousands)

	Age Group 65-74	75-84	85+	TOTAL
		1985		
Baseline	2,098	2,261	1,106	5,465
Annual Percent Increase in Beds Assumed				
		2000		
0.0	2,328	3,275	2,113	7,716
1.05%	2,301	3,195	1,998	7,494
2.2%	2,267	3,093	1,850	7,210
		2020		
0.0	4,006	4,107	3,255	11,368
1.05%	3,916	3,928	2,945	10,789
2.2%	3,815	3,724	2,593	10,131
		2040		
0.0	4,030	7,295	6,399	17,724
1.05%	3,934	6,960	5,813	16,707
2.2%	3,757	6,342	4,733	14,832

Source: Tabulations of the 1982 and 1984 National Long Term Care Survey.

In the table we see that different growth rates in the number of institutional beds can have a significant effect on the number of disabled persons resident in the community. In the year 2000 the difference would be 506 thousand cases. In 2040 the difference is 2.9 million cases with the biggest changes occurring in the population aged 85 and over.

In the above we examined the various sources of uncertainty (i.e., mortality assumptions; changes in health; changes in institutional rates) in the future growth and residence of the functionally disabled elderly and oldest-old populations. Despite any plausible combination of those factors certain qualitative observations about the size and composition of the disabled elderly population are likely to hold: First, that there will be a large increase in the disabled elderly population driven largely by increases in the size of the oldest-old population--the population group with the highest level of need for LTC services; second, that the growth of demand for LTC services will be concentrated among women who, with their greater life expectancy, will tend to survive their spouses; and third, that institutional care, unless there is a dramatic reversal of current

policy, is likely to cover a decreasing proportion of the total need for LTC care in the U.S (e.g., under baseline assumptions it would decline from 5.17% in 1985 to 4.38% in 2060 of the total U.S. elderly disabled population; Manton, 1988a).

B. Functional and Health Status Characteristics and Transitions of the U.S. Elderly Medicare Population

In evaluating the basic characteristics of the chronically disabled U.S. Medicare eligible population (the samples of the 1982 and 1984 NLTCS are drawn from lists of Medicare eligible populations) a number of descriptive and multivariate analyses were done. For example, GOM analyses were conducted of the 1982 (and 1984) NLTCS population in order to identify subgroups defined on multiple health and functional characteristics. These cross-sectional multivariate analyses were reported, for example, in Manton and Soldo (1988). Those analyses identified a number of distinctive health and functional status profiles. For example, the partly independent role of cognitive versus physical impairment in different subgroups was defined. A subgroup of the "oldest-old" frail population could be distinguished from a much younger, acutely ill and morbid subgroups. Characterization of these subpopulations provided useful information for a number of focused policy analyses conducted later.

A fundamental factor in determining the future need for LTC services is the age related risk of functional disability for individuals. Thus, in addition to the descriptive, cross-sectional analyses described above, studies of functional and health changes were conducted. Previously, most national estimates of this risk were based on prevalence estimates derived from cross-sectional health surveys. The 1982 and 1984 NLTCS provide nationally representative, longitudinal data on health transitions in the U.S. elderly population. From these data true disability incidence data can be derived with specially developed prospective sample weights. Specifically, the longitudinal sample weights provided on the Census public use files provide weights for persons who were interviewed in both 1982 and 1984. Thus, they are useful to examine the 1982 status of persons interviewed in 1984. To assess changes from 1982 to 1984 new weights were calculated, based on the 1982 sample structure, that accounted for all persons who could have potentially fallen in the sample frame in 1984 (Manton, 1988b,c).

Two-year transition rates estimated from the 1982 and 1984 NLTCS are provided in Table 5, specific to sex and age.

From the table we see that male and female disability two-year incidence rates are very similar (e.g., 14% and 11.3% for males and females aged 65 to 74, respectively). However, the mortality risks for females are much lower at every age and disability level than for males. This means that once disability onsets, females are likely to live more years with disability than males. This explains why the prevalence of disability is higher for females in cross-sectional surveys.

From the table we also see that there is considerable reported long-term improvement in survival. In other analyses we found 23.6% of persons aged 65 and over with 3 to 4 ADLs and 22.8% of persons with 5-6 ADLs improving their functional status after two years (Manton, 1988b). Among two-year survivors, the number who improve after two years is even higher--31.1% and 35.4% with 3-4 and 5-6 ADLs, respectively.

In Table 5, in contrast, we see that 27.4% of males and 29.3% of females aged 65 to 74 with 5 to 6 ADLs have improved functional status two years later. For males and females aged 85 and over, the degree of improvement is still significant --12.8% and 13.9%, respectively. Adjusted for survival the male improvement at age 65 to 74 is 42.3%; at age 85 and above it is 27%. For

TABLE 5: Transition Probabilities (%) of 1982 Versus 1984 Disability Status for Males and Females by Three Age Groups

1982 STATUS			1984 STATUS: Not Disabled		IADL Only		1-2 ADLs		3-4 ADLs		5-6 ADLs		Institutional		Deceased		TOTAL	
			Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Not Disabled[a]																		
65-74	85.99	88.73	2.48	3.54	1.39	2.13	0.72	0.77	0.55	0.55	0.62	0.50	8.24	3.79	87.56	86.37		
75-84	72.87	73.74	4.77	6.39	3.66	5.01	0.71	1.66	1.42	1.06	1.63	3.08	14.93	9.06	75.74	68.95		
85+	48.77	46.49	6.69	7.24	8.76	10.92	3.14	2.38	2.05	3.56	4.32	10.16	26.27	19.25	50.41	39.65		
IADL Only																		
65-74	14.62	13.09	48.62	45.56	12.49	20.48	0.95	5.71	4.87	2.84	1.90	4.13	16.54	8.19	3.63	4.02		
75-84	11.00	4.90	36.64	37.60	13.93	25.87	6.54	5.74	7.15	2.87	6.69	7.72	18.05	15.29	6.17	6.61		
85+	1.42	0.60	33.41	29.12	15.40	28.21	6.65	5.25	4.04	6.34	5.68	11.18	33.41	19.31	7.81	6.75		
1-2 ADLs																		
65-74	3.43	7.88	15.96	19.92	31.24	39.82	16.24	10.79	7.15	4.79	5.32	4.22	20.67	12.61	3.04	4.10		
75-84	2.62	2.66	11.47	15.09	29.59	37.00	8.26	12.81	8.08	4.26	2.49	10.11	37.49	18.08	5.82	8.33		
85+	0.00	0.67	6.58	8.81	20.86	32.39	10.97	16.07	13.79	8.57	15.68	12.32	32.13	21.18	12.57	12.15		
3-4 ADLs																		
65-74	4.63	2.85	5.44	6.03	19.89	27.61	22.15	28.28	17.19	16.98	2.43	6.38	28.29	11.88	1.51	1.62		
75-84	3.09	0.41	3.09	3.68	8.55	20.14	18.54	23.70	18.17	20.50	10.46	12.26	38.10	19.32	2.34	3.53		
85+	0.00	0.00	1.82	2.24	5.45	7.85	12.14	21.52	19.98	26.04	12.72	17.55	47.90	24.78	6.10	5.43		
5-6 ADLs																		
65-74	1.26	1.08	6.18	8.64	9.87	9.39	10.13	10.16	31.90	32.68	5.69	7.65	35.12	30.40	1.87	1.64		
75-84	1.35	0.45	4.72	4.42	5.02	8.38	8.11	9.26	26.40	35.04	8.12	12.82	46.27	29.64	3.61	3.29		
85+	0.00	0.00	0.00	1.10	4.28	6.27	8.56	6.45	27.14	27.36	6.42	14.34	53.60	44.49	5.18	7.30		
Institutional as of 4-1-82																		
65-74	1.68	2.14	0.84	0.61	2.53	1.07	0.84	2.29	1.68	1.24	57.34	68.95	35.08	23.71	1.45	1.54		
75-84	0.54	0.38	1.64	0.97	0.54	0.60	1.63	0.60	0.56	1.09	49.83	61.78	45.25	34.58	4.14	6.90		
85+	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.83	0.00	0.66	37.54	53.05	62.46	44.97	13.54	23.91		
'82 Detail Noncompleters																		
65-74	4.63	8.74	6.69	17.48	4.63	19.82	9.41	11.51	4.46	8.74	9.08	2.77	61.10	30.91	0.62	0.39		
75-84	6.72	6.57	9.33	5.28	6.72	10.49	2.24	6.55	8.96	9.21	4.49	25.00	61.52	36.89	1.24	1.22		
85+	0.00	0.00	5.55	2.33	5.55	4.67	0.00	7.01	0.00	9.34	16.67	34.65	72.22	42.02	2.00	1.86		

TABLE 5 (cont'd.)

Institutional (after 4-1-82)															
65-74	7.77	5.80	3.88	6.18	0.00	5.42	7.77	3.09	2.89	0.00	38.84	43.54	38.85	35.95	0.31	0.32
75-84	0.00	5.16	0.00	5.95	5.12	6.06	0.00	2.69	2.59	3.60	35.84	41.11	56.45	35.44	0.93	1.17
85+	0.00	1.34	0.00	0.00	4.00	0.00	4.00	0.00	5.74	2.69	32.00	52.13	60.00	43.85	2.39	2.95
TOTAL																
65-74	76.27	77.80	4.67	5.98	3.15	4.95	1.76	2.03	1.77	1.64	1.92	2.22	10.46	5.38	100.00	100.00
75-84	56.25	51.70	6.95	8.58	5.89	9.38	2.25	3.85	3.52	3.36	4.83	9.47	20.30	13.67	100.00	100.00
85+	24.24	18.16	7.05	6.24	8.92	11.09	4.76	6.71	5.74	6.71	12.06	23.45	37.25	29.12	100.00	100.00

[a]Includes those not disabled on screener or detailed interview.

SOURCE: Tabulations of 1982 and 1984 National Long Term Care Survey and 1985 National Nursing Home Survey.

females aged 65 to 74 the survival adjusted figure is 41% and, at ages 85 and above 25% . Thus, for both sexes, and even at advanced ages (85+) there is a considerable probability of improvement in individual functioning.

A third observation is the importance of disability as a mortality risk factor. There is nearly a five-fold increase in mortality risks for persons with 5-6 ADLs (37.2% over two years) impaired compared to those with no impairment (8.1%). Even for persons aged 85 and above, the mortality risk increases over two-fold for persons with 5 to 6 ADL impaired versus those with no reported impairment (for males from 26.3 to 53.6% and for females from 19.3 to 44.5%). The risk of disability increases, and the likelihood of functional improvement declines, with age though, even at age 85, there remains a significant likelihood of functional improvement.

One issue is the nature of the biomedical factors that generate the sex differential in male-female disability risks (Manton, 1988c). This is illustrated in Table 6.

In Table 6 we see that males are more likely to report acute, lethal diseases (e.g., cancer and heart disease, chronic and acute lung diseases) as causes of their disability than females who report more disabling conditions (e.g., senility, arthritis, diabetes).

C. Re-calculation of the AAPCC Underwriting Factors

The AAPCC methodology is currently used to reimburse HMOs who have accepted at-risk contracts from Medicare (Kunkel and Powell, 1981). This methodology is based upon underwriting factors specific to age, sex, welfare and institutional status, which were calculated from three years (1974 to 1976) of the Current Medicare Survey (CMS). We recalculated these underwriting factors using the more recent (and more extensive, 22,000 person-years of experience for the elderly in the 1984 NLTCS versus 20,000 total person-years for all Medicare beneficiaries of the CMS) data from the 1984 NLTCS linked to Medicare Part A and Part B records for the year 1984. The age, sex, and institutional stratifications were based upon the sample information. Welfare status was based upon the existence of a Medicaid Buy-in indicator on the Medicare Master Third Party Buy-in file. An experimental stratification based upon disability status (as determined from the survey; an ADL or IADL impairment that had lasted or was expected to last 90 days or more) was also tried as well as a stratification for disability based upon the prior reason for enrollment. Adjustments had to be made for a 35-day gap in the Part B records and for death during the year by calculating factors adjusted to total number of days of exposure to service use. These underwriting factors for total Medicare expenses (Part A and Part B decompositions were also conducted) stratified by disability level are presented in Table 7 (Manton, 1988d).

The underwriting factors, which represent the ratio of the average expenditure for the underwriting category relative to the national average expenditures (not stratified by any of the underwriting factors) show that disability as reported on the survey has a large effect on the underwriting factors for both males and females. For example, for males aged 65 to 69 the difference for community residents was 177% (i.e., 1.91 versus 0.69). Disability based on prior reason for entitlement did not perform satisfactorily. Thus, if additional underwriting factors are to be introduced into the AAPCC consideration should be paid to functional status.

D. Effects of Changes in Medicare Reimbursement Policy on Medicare Service Use Patterns, Mortality Risks and Rehospitalization Rates

An important set of questions emerged with the introduction of the Prospective Payment System (PPS) for reimbursing acute hospital episodes by Medicare. These questions involved whether the utilization of other Medicare services (i.e., home health care, SNF, out-patient care) or

TABLE 6: Weighted Percent of Disabled Sample Persons Reporting Disabling Medical Conditions by Condition, 1984 NLTCS, by Sex

	IADL Disability		1-2 ADL Disabilities		3-4 ADL Disabilities		5-6 ADL Disabilities		TOTAL	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Cancer	4.6	3.3	4.8	3.3	7.2	5.3	8.3	7.4	5.7	4.2
Ischemic Heart Disease	5.8	3.4	2.4	3.2	5.1	4.4	8.0	4.5	5.0	3.6
Hypertension	7.4	10.2	6.0	9.7	6.2	13.7	5.9	11.6	6.6	10.8
Other Circulatory Disease	29.9	26.5	29.4	24.0	34.1	29.3	48.4	40.8	33.6	28.1
Senility	12.3	14.9	10.5	14.8	16.9	15.5	19.5	23.8	13.7	16.2
Mental Disorders	3.7	4.1	4.3	4.2	3.4	5.8	5.5	6.2	4.1	4.7
Parkinson's Disease	4.3	6.9	8.7	5.5	8.9	9.6	20.4	13.5	9.1	7.8
Visual Disorders	17.4	16.5	17.8	13.3	14.3	14.5	13.3	13.0	16.4	14.6
Deafness	12.4	4.2	8.7	3.3	4.3	2.6	4.7	6.0	8.7	3.9
Ulcers	1.2	0.6	0.6	1.1	2.1	0.7	0.9	0.5	1.2	0.8
Hernia	1.5	2.4	2.1	2.0	1.2	1.7	1.1	1.9	1.5	2.1
Other Digestive Disorder	4.4	3.9	3.4	4.4	4.4	4.0	4.9	4.9	4.2	4.2
Kidney & Bladder Disease	2.6	2.4	3.5	2.4	2.9	3.4	3.9	3.1	3.2	2.7
Genito-Urinary Disease	2.5	0.3	2.0	0.9	2.5	0.3	2.2	0.2	2.3	0.5
Emphysema & Bronchitis	10.8	3.6	8.4	2.8	5.5	2.1	10.2	2.1	9.2	2.9
Acute Respiratory Disease	7.9	5.0	7.1	4.3	5.0	3.8	5.3	2.5	6.8	4.2
Skin Disease	0.7	1.6	0.6	1.5	0.6	2.0	0.3	1.7	0.6	1.7
Arthritis	22.0	34.8	35.7	43.8	32.6	48.9	19.7	33.8	27.3	40.0
Other Skeletal Problems	17.8	19.8	26.8	25.7	35.0	27.5	22.3	19.7	23.8	23.1
Residual	4.1	15.5	8.4	17.8	12.7	21.4	6.1	20.2	7.0	17.9
Mean Number of Conditions	1.8	1.9	2.0	1.9	2.1	2.2	2.2	2.3	2.0	2.0

SOURCE: Tabulations of 1984 National Long Term Care Survey.

TABLE 7: Ratio of Program Expenditures for Medicare Covered Services[1] by Sex, Age, Disability[2] and Medicaid Buy-in Status Using the 1984 National Long Term Care Survey

	Institutional			Community Disabled			Community Non-Disabled		
	Buy-in	Non-Buy-in	Total	Buy-in	Non-Buy-in	Total	Buy-in	Non-Buy-in	Total
MALES					PART A				
85+	1.18	2.76	2.28	1.12	1.86	1.77	3.54	1.19	1.31
80-84	1.80	4.25	3.31	1.25	1.89	1.81	1.58	1.13	1.19
75-79	0.99	2.65	2.27	1.77	2.29	2.21	0.92	1.10	1.09
70-74	0.40	1.99	1.40	2.35	2.02	2.07	0.72	0.89	0.88
65-69	1.50	1.80	1.63	2.41	1.88	1.94	2.04	0.62	0.65
					PART B				
85+	1.11	1.63	1.47	1.23	1.38	1.36	3.03	1.27	1.36
80-84	1.56	2.59	2.19	1.65	1.65	1.65	1.39	1.05	1.07
75-79	1.16	2.74	2.38	1.66	1.61	1.61	0.81	1.00	0.99
70-74	2.02	1.70	1.82	2.96	1.91	2.06	0.95	0.91	0.91
65-69	1.99	2.11	2.04	2.05	1.82	1.85	1.26	0.74	0.75
					TOTAL				
85+	1.15	2.37	2.00	1.16	1.69	1.63	3.36	1.22	1.33
80-84	1.72	3.67	2.92	1.39	1.81	1.75	1.51	1.13	1.15
75-79	1.05	2.68	2.30	1.73	2.05	2.00	0.88	1.07	1.06
70-74	0.97	1.89	1.55	2.56	1.98	2.07	0.80	0.90	0.89
65-69	1.67	1.91	1.78	2.28	1.86	1.91	1.77	0.66	0.69
FEMALES					PART A				
85+	1.36	1.26	1.29	1.91	1.86	1.87	2.57	1.10	1.23
80-84	1.26	1.97	1.73	1.91	1.68	1.72	1.27	0.95	0.97
75-79	1.45	1.94	1.77	1.37	1.78	1.69	1.31	0.72	0.76
70-74	1.74	2.79	2.34	1.67	1.87	1.83	0.87	0.59	0.61
65-69	3.02	2.61	2.79	1.71	1.88	1.85	0.77	0.40	0.42

TABLE 7 (cont'd.)

PART B

85+	1.30	1.15	1.20	1.28	1.16	1.19	1.49	0.88	0.93
80-84	1.61	2.24	2.03	1.49	1.51	1.51	1.11	0.87	0.89
75-79	2.26	2.71	2.55	1.82	1.42	1.51	1.93	0.80	0.88
70-74	1.57	1.97	1.80	1.88	1.75	1.78	1.37	0.70	0.74
65-69	2.82	2.36	2.56	1.72	1.80	1.79	0.95	0.54	0.57

TOTAL

85+	1.34	1.22	1.26	1.69	1.62	1.63	2.19	1.02	1.13
80-84	1.38	2.07	1.83	1.76	1.62	1.65	1.21	0.92	0.94
75-79	1.73	2.21	2.04	1.53	1.65	1.63	1.53	0.75	0.80
70-74	1.68	2.51	2.16	1.74	1.83	1.81	1.04	0.63	0.66
65-69	2.95	2.52	2.71	1.71	1.85	1.83	0.83	0.45	0.47

[1]Base (i.e., 1.0) is national average for relevant Medicare program expenditure.

[2]Disability is based upon the presence of a chronic (90-day) impairment in an ADL or IADL as reported in the 1984 National Long Term Care Survey.

LTC was effected by changes in hospital utilization stimulated by PPS. There was also concern that the economic disciplines enforced by PPS might adversely affect the quality of care provided to Medicare beneficiaries. These questions were examined within certain data constraints by analyses of the 1982 and 1984 NLTCS linked to Medicare Part A service data.

Specifically, because PPS was introduced in the interval between the two NLTCS (i.e., from Oct. 1, 1983 to Sept. 30, 1984) one could examine the service use and outcomes of the respondents to the 1982 and 1984 surveys in terms of a pre-post experimental design with the introduction of PPS as the experimental condition. This was done by linking all Medicare Part A service in the 12 months after October 1982 and October 1984 to the corresponding 1982 and 1984 NLTC survey records. Then analyses of the chronic health and functional characteristics of persons in those two surveys could be used to identify subgroups who had particular sets of chronic functional and health problems using the GOM methodology. Life tables were then calculated for those subgroups which represented hospital, home health, SNF and community episodes that occurred to those people during the 12-month service use window. Since the GOM analysis was applied to health and functional data pooled for 1982 and 1984, the health and functional status subgroups were identically defined for the two periods. Since the survey samples in the two years were selected to be chronically disabled this meant that we could analyze changes in service use and health outcomes for the frailest subpopulations of the Medicare beneficiary population--persons who would possibly be particularly susceptible to adverse effects of PPS.

The results were quite clear. The data show there was little evidence of an increase in mortality for the frail subpopulations between the two service windows (i.e., October 1982 to September 1983 and October 1984 to September 1985). Since hospitalization rates declined due to PPS there did tend to be an increase in the severity of hospital case-mix but, in other studies, after controlling for case-mix at admission there was no evidence of increased hospital mortality. In addition the risk of hospital readmission declined. Thus on at least two measures, for the periods under study, there was little adverse effect demonstratable from PPS--even for these frail, susceptible subpopulations (Liu and Manton, 1988a; Manton and Liu, 1988).

In contrast there were significant effects of PPS on the pattern of Medicare service use. Home health service use increased. Hospital LOS decreased--even for the frail subpopulations who had initially longer LOS. It appears that from data from the 1985 NNHS, the case mix severity of nursing home residents increased. Many of these effects can be viewed as reasonable shifts in service use patterns given that the quality of care delivered is maintained.

The primary study limitations are that Medicare Part B services were not included and we had data only on Medicare SNF and not for other types of nursing homes.

E. The Development of Case-Mix Measures for Reimbursing Medicare Home Health Services

With the success of the PPS for reimbursing acute hospital services the possible development of case-mix adjusted reimbursement for LTC services was raised. A major type of LTC service for which these questions were posed was home health services. The linkage of the 1982 and 1984 NLTCS to the Medicare Part A service records provided an opportunity to investigate this possibility.

In one series of studies an evaluation was made of the health and functional status characteristics of all persons in the 1982 NLTCS sample who received home health services (Manton and Hausner, 1987). For the group receiving the detailed household interview a GOM analyses was made of 56 health and functional status dimensions. This analysis identified six dimensions that described the health and functional status of those persons. The individual scores

for these six dimensions were then regressed on measures of the use of Medicare home health, i.e., total expenditures and total number of home health visits. The six dimensions were found to explain a significant proportion of the variation in individual levels of home health service use and that the six different subgroups had very different levels of service use. This predictability was found to hold for service use within 12 months of the survey data.

In addition, extended models were estimated which included regional variation in the use of other (i.e., non-home health) services and other demographic characteristics of the clients. Overall, even though the detailed case-mix measures were available for only a proportion of the sample, the extended models could explain up to 25.3% of the variance in home visits and expenses.

In addition case-mix measures were estimated with 58 variables where two indices of service use were introduced. This is consistent with the usual development of case-mix measures where service use is used to calibrate the differences between categories (e.g., in the RUGSII system the 16 categories were defined on the basis of the amount of nursing services delivered). These groups explained nearly 50% of the individual variation in home health service use.

The 56-variable groups were clinically interpretable and would be preferred on the basis that they were constructed independently of the service use measures. Thus, the definition of the 56 variable groups would not be altered by changes in payment levels for home health services. The advantage of the 58-variable groups is that, they are objectively determined, combine considerable clinical data with the service measures, and have very high levels of predictive power for home health service use.

In an additional series of analysis the case-mix groups were derived from the 1984 NLTCS survey population for the same 56 measures. Similar dimensions were extracted from the analyses of the 1984 data except that a mentally impaired group was less prominent and the level of prediction in the 1984 data was somewhat smaller. Part of the reduction in the ability to predict service use seemed to result from a tightening of home health regulations that reduced the number of persons with extremely large amounts of service use.

F. Out-Of-Pocket Payments

An important set of issues that emerged during consideration of the extension of catastrophic coverage for acute medical services was the patterns of expenditures made out-of-pocket for various types of medical and formal LTC services. These spending patterns were analyzed using data from the 1984 NLTCS and involved extension of analyses performed with the 1982 NLTCS (Liu et al., 1985; Manton and Liu, 1988). We examined the variation of these patterns of expenditures for persons with different income levels. We evaluated how much was spent for nursing versus other services. It was found that, among persons paying out-of-pocket, that the average monthly expenditure in 1982 was $164 with persons having lower levels of disability paying between $88 to $117 and with 5 to 6 ADL's paying $439. For those receiving nursing services the average monthly expenditures were much higher--$424. It was found that the ability to pay for services influenced the ability of persons to stay out of nursing homes. It was found that even persons with 5-6 ADL impairments could stay in the community with adequate social, housing and economic resources--indeed the community resident population with 5 to 6 ADL's was nearly as large as the institutional population with that level of impairment. The out-of-pocket expenditure patterns for all payees and for payees using nursing services are presented in Table 8.

G. Medicaid Spend-Down and Institutionalization

An important set of issues that were addressed with the longitudinal files of the 1982 and

TABLE 8: Summary Statistics on Reported Out-of-Pocket Payments for a Month for Those Receiving Any Home Care and Those Receiving Home Nursing Care, by Activity of Daily Living (ADL) Limitation Level: United States, 1982

	Home Care Only			Home Nursing Care		
	All Payors With IADLs/ADLs	Up to 4 ADL Limitations	5-6 ADL Limitations	All Payors With IADLs/ADLs	Up to 4 ADL Limitations	5-6 ADL Limitations
Persons Paying Out-of-Pocket*	608.0	484.0	124.0	58.0	30.7	27.4
Average Monthly Payment	$164	$93	$439	$424	$156	$724
Payment at Selected Percentiles of Payors						
10th	$6	$6	$15	$9	$6	$24
25th	15	14	40	20	13	40
50th	40	34	140	90	74	100
75th	135	85	450	400	229	807
90th	400	237	1,260	880	400	1,922

*Number in thousands.

SOURCE: 1982 NLTCS

1984 NLTCS was the phenomenon of Medicaid "spenddown" and "spousal impoverishment." Specifically, it can be the case that institutional care exhausts the private financial resources of the patient until the person can no longer remain in the institution except with Medicaid reimbursement. The effects of such spenddown are particularly significant when they deplete the resources of a noninstitutionalized spouse. The institutional sample of the 1984 NLTCS was used to assess the process of spenddown and the likelihood of spousal impoverishment. Transitions of this process are presented in Figure 1 (Liu and Manton, 1988b).

The actual rates of spenddown varied nearly seven-fold from 6% for persons in the community to 41% for persons in nursing homes in 1984.

H. Nursing Home Transitions

One of the unique properties of the institutional sample of the 1984 NLTCS is that it is a true "admissions" cohort which can be used to study the risk of institutionalization between 1982 and 1984. The NNHS, in contrast, begins with persons who are already institutionalized. Thus, the 1987 follow-up NNHS covers only the next-of-kin of institutional residents in 1985 NNHS. The so-called "discharge" sample of the 1985 NNHS will reflect incidence patterns except for differences in the size of admission cohorts.

The institutional sample of the 1984 NLTCS was used to study the pattern of utilization of institutions. This was done by devising rules to discriminate between long- and short-term residents among the persons in institutions in 1984. This was done by contrasting persons who entered the institution during the inter-survey interval with those who were in the institution at the time of the 1982 survey. A variety of characteristics of the short- and long-term nursing home residents was analyzed using multinomial logistic regression procedures (Liu, DeVita, and Manton, 1988).

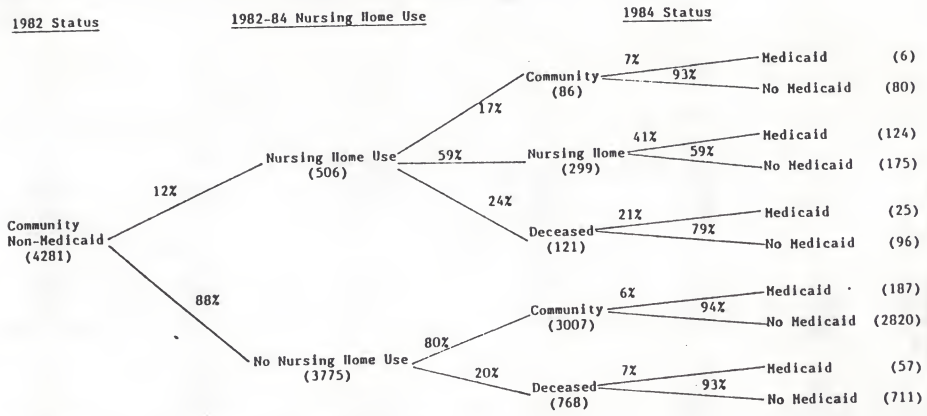
I. Transitions of Medicaid Nursing Home Residents

Analyses were conducted of the longitudinal (24 months) experience of two monthly cohorts of persons entering Type D (nursing home) Medicaid facilities who were SSI beneficiaries. These analyses addressed program utilization with regard to payment and residence characteristics and how those characteristics varied with institutional characteristics (Manton and Lowrimore, 1986). A grade of membership analysis was conducted of beneficiary characteristics and the characteristics of their residences and, conditional upon subgroups identified residential, program entitlement and mortality life tables calculated. In the analysis two elderly populations were identified--one resident in SNFs who was more likely to be active payment status and to change residence, and a second group resident in ICFs who were less likely to remain payment active but not to change residence until death. A third elderly group identified was resident primarily in institutions with high levels of rehabilitation services. The fourth group identified was a mixture of young and middle-aged mentally impaired persons resident in ICF-MRs. Durations of residence, payment and survival were calculated for all groups.

J. Long Term Care Insurance

A number of analyses were conducted of the characteristics of the disabled population who might represent a market for private LTC insurance. This involved investigation of three surveys: the NLTCS, the SOA-LSOA and the NNHS. It was found, for example, that, in addition to income restrictions, there would be significant numbers of persons who had disabilities and chronic medical problems. This is illustrated in Table 9 (Liu, Manton, and Liu, 1989).

Figure 1: Nursing Home and Medicaid Status Transitions:
Non-Medicaid, Community Residents in 1982



Note: Number in parentheses is the number of cases.

SOURCE: 1982 NLTCS

TABLE 9: Percent of Population With Any One or More of Five Chronic Conditions by Income and Level of Disability

Income and Age	Population** (in 000s)	Presence of Condition With No ADL	Presence of Condition With < 3 ADL	Presence of Condition With 3+ ADL	Presence of Condition Total
Less than $7,000					
55-64	2,384	42.27%*	16.58%*	9.88%*	68.73%*
65-74	2,949	52.18	17.60	5.83	75.61
75-84	2,422	43.43	22.22	7.99	73.64
85+	617	24.38	28.39	15.85	68.63
Total	8,372				
$7,000 - $15,000					
55-64	4,664	44.26	11.63	3.83	59.72
65-74	5,936	51.44	11.56	4.70	67.70
75-84	3,087	45.15	16.29	7.25	68.69
85+	500	34.32	21.33	16.68	72.32
Total	14,187				
$15,000 - $25,000					
55-64	5,698	44.25	6.61	2.19	53.05
65-74	4,153	50.64	8.70	2.87	62.21
75-84	1,542	49.12	13.28	7.27	69.66
85+	284	23.11	25.46	19.99	68.57
Total	11,677				
Greater than $25,000					
55-64	9,706	42.96	3.35	0.82	47.14
65-74	3,330	51.24	7.66	2.88	61.79
75-84	991	52.06	10.82	9.61	72.50
85+	302	30.55	15.49	30.39	76.44
Total	14,329				
Total	48,565				

*Percentage of cell population; e.g., 42.27% of group aged 55-64 with incomes less than $7,000.
**7.4 Million elderly who did not provide amount of income were distributed proportionately.
SOURCE: 1984 NHIS SOA

TABLE 10: Transitions Between 1982 and 1984 for Persons With Heart Disease, Stroke or Cancer in 1982*

1982 Status	1984 Status: Higher Disability			1984 Status: Died			1984 Status: Institutionalized		
	Heart	Stroke	Cancer	Heart	Stroke	Cancer	Heart	Stroke	Cancer
Non-disabled	51.2%	59.2%	44.7%	9.2%	—	22.2%	0.7%	9.5%	—
IADL Only	30.6	28.1	19.9	14.5	22.2	37.5	5.6	5.0	4.9
ADL 1-2	19.3	21.8	19.8	21.8	35.7	41.3	7.3	10.5	3.5
ADL 3-4	21.4	28.8	21.4	24.3	28.0	36.9	10.3	20.8	15.4
ADL 5-6	---	---	---	38.7	47.5	75.9	8.6	9.1	7.5

*Unweighted number of cases of heart disease (4,081), stroke (420), and cancer (361).

SOURCE: 1982 and 1984 National Long Term Care Surveys.

We see that, even for persons with incomes over $25,000, significant proportions had chronic medical problems even without disabilities. In Table 10 we show the different disability transition rates for persons with three major conditions.

K. Preparation of A Public Use File for the 1982 and 1984 NLTCS and the Provision of Technical Assistance

Given the expertise developed with NLTCS a special public use derivative file was developed for the 1982 and 1984 NLTCS. Preparation of this file involved several steps.

First, it was found that the sample weights provided with the initial Census Bureau file were in error. Consequently, working with the Census Bureau the error was documented, identified and corrected. This involved intensive investigation of the file and the preparation of several new demographic variables as the basis for calculating the new series of sample weights.

Second, the file was organized into a series of different sub-files which required a series of programming steps in order to utilize variables from different files. The use of a "flat" file structure where all variables were organized on a case-basis had been found to be efficient in terms of programming efforts for our own analyses. Consequently a flat file was prepared for the public use tape.

Third, certain coding and editing steps had to be undertaken to a.) eliminate redundant variables; b.) suppress geographic detail because of privacy restrictions; and c.) move variables to certain positions to facilitate programming. Once the file was reformulated a series of tabular runs were made to ensure that the content of the original Census Bureau file was preserved.

Fourth, the Medicare Part A records were prepared in a second, independent file. These records were ordered and edited to be easily accessible and provided with an anonymous identification number so that they could be linked to the survey records.

Fifth, the documentation (~300 pages) for the original file was edited to reflect the new file structures and format.

Sixth, tapes and documentation (all questionnaires, interviewers' instructions and code books) were sent to NTIS.

Finally, technical assistance is being provided to users of the files. This involves consultation about the structure of the file, the design of the samples, and the characteristics of the data. When requests involve access to work files retained only by the Census Bureau those requests are identified and transmitted. For example, resolution of the characteristics of the institutional sample component in 1982 and 1984 was provided by the Census Bureau.

L. International Analyses

The interest in international patterns of LTC need and service use stem from the observation that much can be learned by studying how those needs are met in different socio-cultural and economic settings. One finds, for example, that in developed countries, there is wide variation in the amount of institutional care that is delivered. In contrast, it was found that there was considerable similarity in the physiological processes that generate disability at advanced ages, that the profile of disabilities was functionally similar though they were sometimes manifest in very different behaviors, and that the patterns of sex differentials in morbidity, mortality and disability risks were found in many countries (Manton, Myers and Andrews, 1987; Manton, Dowd and

Woodbury, 1986).

V. Summary

The 1982 and 1984 NLTCS, linked to Medicare Part A service use records for the period 1980 to 1987 and Medicare Part B records for 1984 to 1987, were found useful to respond to a wide range of basic epidemiological, health financing, quality assurance, and policy concerns for acute, post-acute and long-term care. Useful insights were gained into the impact of the PPS on frail elderly Medicare beneficiaries who used acute care hospitals in a pre- and post-PPS period. These insights involved consideration of both quality of care and Medicare service delivery issues. The data sets also proved valuable in assessing the contribution of out-of-pocket payments to catastrophic acute care expenditures. The data were useful in studying a wide range of LTC care issues such as the characteristics of Medicaid spend down, spousal impoverishment, differences in the utilization of institutional care, the use and reimbursement of home health services. In addition the data on basic disability and health transitions were helpful in characterizing the likely duration of LTC service use and to project future patterns of service use.

In addition to the substantive analyses a number of methodological advances were made in both analytic and data collection activities. Certain analyses involved the development of multivariate classification procedures (i.e., the GOM model) and its extension to longitudinal analyses of service use and health changes. In addition, there has been relatively little experience in analyzing national representative longitudinal health surveys of this type. Thus, a wide range of new insights into data collection, analysis, and use (e.g., the calculation of longitudinal sample weights) emerged. It is anticipated that the value of these data will be greatly extended by the collection of a third longitudinal round with a similar sample structure to that of the 1984 survey in 1988. A number of lessons learned in estimating transitions from 1982 to 1984 will be introduced into the 1988 design. The longer-term follow-up will extend the ability to make analyses of cohort differences.

REFERENCES

Katz S, Akpom CA: A measure of primary sociobiological functions. *International Journal of Health Services* 6:493-508, 1976.

Kunkel SA, Powell CK: The Adjusted Average per Capita Cost under risk contract with providers of health care. *Transactions of the Society of Actuaries* 33:221-230, 1981.

Liu K, Manton KG: Effects of PPS on hospital readmissions and mortality of disabled Medicare beneficiaries. In review at *Inquiry*, 1988a.

Liu K, Manton KG: The effect of transitions between community and nursing homes on Medicaid eligibility. *The Gerontologist*, 1988b.

Liu K, Manton KG, Liu B: Morbidity, disability and long-term care: Implications for public and private policies. In review at *Milbank Memorial Fund Quarterly*, 1988.

Liu K, Manton KG, Liu BM: Home care expenses for the disabled elderly. *Health Care Financing Review* 7(2):51-58, 1985.

Liu K, DeVita C, Manton KG: Risks of entering nursing homes for long and short stays. In review at *HCF Review*, 1988.

Manton KG: Epidemiological, demographic, and social correlates of disability among the elderly. *Milbank Memorial Fund Quarterly* 67(suppl. 1 on Disability Policy), forthcoming, 1988a.

Manton KG: A longitudinal study of functional change and mortality in the United States. *Journal of Gerontology* 43(5):153-161, 1988b.

Manton KG: Planning long-term care for heterogeneous older populations. In *Annual Review of Gerontology and Geriatrics*, Vol. 8 (Maddox G, Ed.). Springer, New York, forthcoming, 1988c.

Manton KG: A report on alternative calculations of demographic underwriting factors for the AAPCC formula using data from the 1984 National Long Term Care Survey and linked Part A and B records. Report prepared for Health Care Financing Administration, 1988d.

Manton KG, Dowd JE, Woodbury MA: Conceptual and measurement issues in assessing disability cross-nationally: Analysis of a WHO-sponsored survey of the disablement process in Indonesia. *Journal Cross-Cultural Gerontology* 1:339-362, 1986.

Manton KG, Hausner T: A multidimensional approach to case mix for home health services. *HCF Review* 8(4):37-54, 1987.

Manton KG, Liu K: Recent changes in service use patterns of disabled Medicare beneficiaries. In review at *HCF Review*, 1988.

Manton KG, Lowrimore G: Patterns of utilization of type D living arrangement by four types of SSI beneficiaries: The relation of individual and facility characteristics to 24-month changes in payment and residence characteristics. Report prepared for Health Care Financing Administration, 1986.

Manton KG, Myers GC and Andrews G: Morbidity and disability patterns in four developing nations: Their implications for social and economic integration of the elderly. *Journal Cross-Cultural Gerontology* 2:115-129, 1987.

Manton KG, Soldo BJ: Disability and mortality among the oldest-old: Implications for long term care service needs. Chapter in *Forecasting the Health of the Oldest Old* (Manton KG, Singer B, Suzman R, Eds.). Oxford University Press, New York, forthcoming, 1988.

Social Security Administration. Office of the Actuary: *Social Security Area Population Projections: 1987*. Actuarial Study No. 99, SSA Pub. No. 11-11546, 1987.

Torrey BB: The visible costs of the invisible aged: The fiscal implications of the growth in the very old. Presented at the American Association for the Advancement of Science meetings, New York, 1984.

Woodbury MA, Clive J, and Garson A: Mathematical typology: A Grade of Membership technique for obtaining disease definition. *Computers and Biomedical Research* 11:227-298, 1978.

Woodbury MA and Manton KG: A new procedure for analysis of medical classification. *Methods of Information in Medicine* 21:210-220, 1982.

CMS LIBRARY
3 8095 00013428 4